



150 YEARS
OF ADVANCING
PUBLIC
HEALTH

Massachusetts Department of Public Health

Health Care Associated Infections in 2018 Acute Care Hospitals

Public Health Council
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Introduction

Healthcare-associated infections (HAIs) are infections that patients acquire during the course of receiving treatment for other conditions within a healthcare setting.

HAIs are among the leading causes of preventable death in the United States, affecting 1 in 17 hospitalized patients, accounting for an estimated 1.7 million infections and an associated 98,000 deaths.*

The Massachusetts Department of Public Health (DPH) developed this data update as a component of the Statewide Infection Prevention and Control Program created pursuant to [Chapter 58 of the Acts of 2006](#).

- Massachusetts law provides DPH with the legal authority to conduct surveillance, and to investigate and control the spread of communicable and infectious diseases. ([MGL c. 111, sections 6 & 7](#))
- DPH implements this responsibility in hospitals through the hospital licensing regulation. ([105 CMR 130.000](#))
- Section 51H of chapter 111 of the Massachusetts General Laws authorizes the Department to collect HAI data and disseminate the information publicly to encourage quality improvement. (<https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXVI/Chapter111/Section51H>)

*Haque M, Sartelli M, McKimm J, Abu Bakar M. Health care-associated infections - an overview. *Infect Drug Resist.* 2018;11:2321–2333.

Purpose

This HAI presentation is the 10th annual Public Health Council update:

- It is an important component of larger efforts to reduce preventable infections in health care settings
- It presents an analysis of progress on infection prevention within Massachusetts acute care hospitals
- It is based upon work supported by state funds and the Centers for Disease Control and Prevention (CDC)
- It provides an overview of antibiotic resistance and stewardship activities

Methods

This data summary includes the following statewide measures for the 2018 calendar year (January 1, 2018 – December 31, 2018) as reported to the CDC's National Healthcare Safety Network (NHSN).

The DPH required measures are consistent with the Centers for Medicare and Medicaid Services (CMS) quality reporting measures.

- Central line associated bloodstream infections (CLABSI) in intensive care units
- Catheter associated urinary tract infections (CAUTI) in intensive care units
- Specific surgical site infections (SSI)
- Specific facility wide laboratory identified events (LabID)

* National baseline data for each measure are based on a statistical risk model derived from 2015 national data

^ All data were extracted from NHSN on June 17, 2019

Measures

- **Standardized Infection Ratio (SIR)**

$$\text{Standardized Infection Ratio (SIR)} = \frac{\text{Actual Number of Infections}}{\text{Predicted Number of Infections}}$$

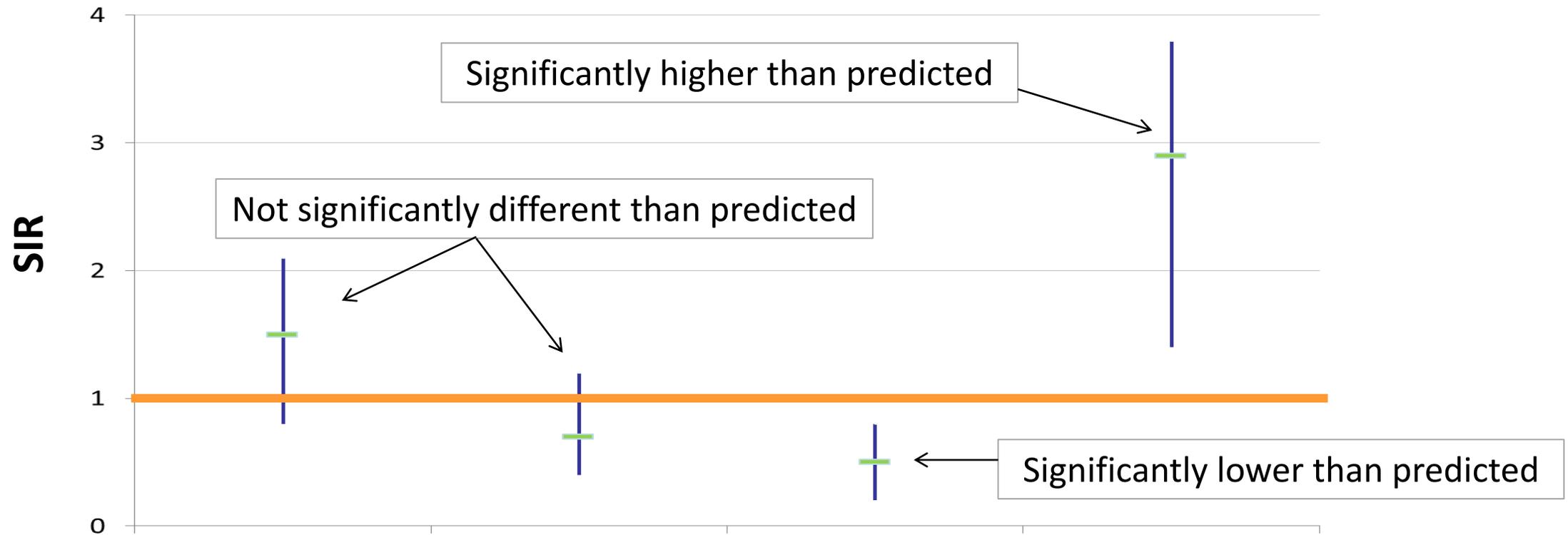
New this year:

- **Standard Utilization Ratio (SUR)**

$$\text{Standard Utilization Ratio} = \frac{\text{Number of Device Days}}{\text{Predicted Number of Device Days}}$$

- If the SIR/SUR > 1.0, then more infections/device days were reported than predicted
- If the SIR/SUR = 1.0, then the number of infections/number of device days is equal to the predicted number
- If the SIR/SUR < 1.0, then fewer infections/device days were reported than predicted

How to Interpret SIRs and 95% Confidence Intervals (CIs)



The **green** horizontal bar represents the SIR, and the **blue** vertical bar represents the 95% confidence interval (CI). The 95% CI measures the probability that the true SIR falls between the two parameters.

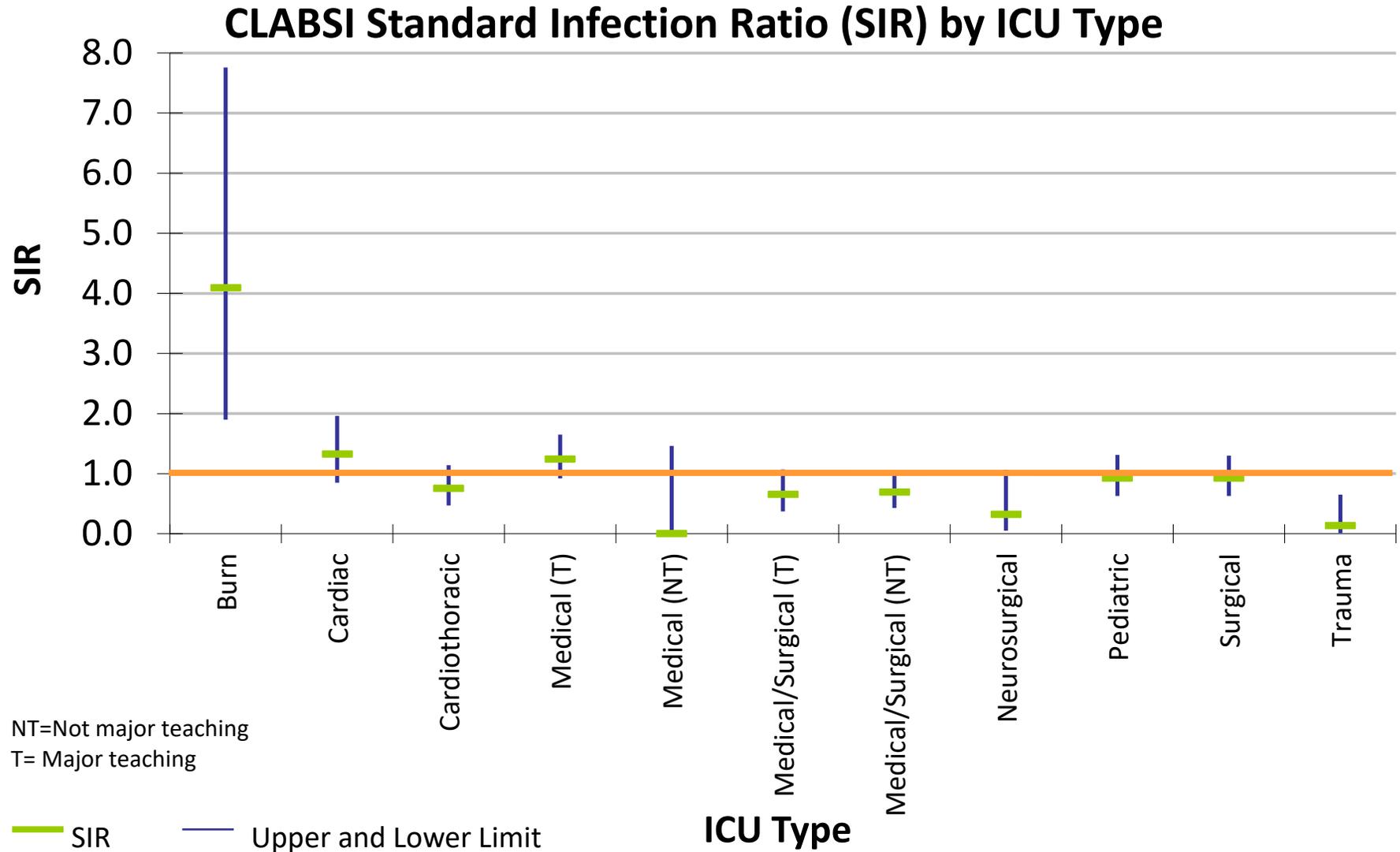
- If the blue vertical bar crosses 1.0 (highlighted in **orange**), then the actual rate is not statistically significantly different from the predicted rate.
- If the blue vertical bar is completely above or below 1.0, then the actual is statistically significantly different from the predicted rate.

Central Line-Associated Bloodstream Infections (CLABSI) in Adult and Pediatric ICUs

Key Findings

One ICU type, Trauma, experienced a significantly lower number of infections than predicted, based on 2015 national aggregate data.

One ICU type, Burn, experienced a significantly higher number of infections than predicted, based on 2015 national aggregate data.

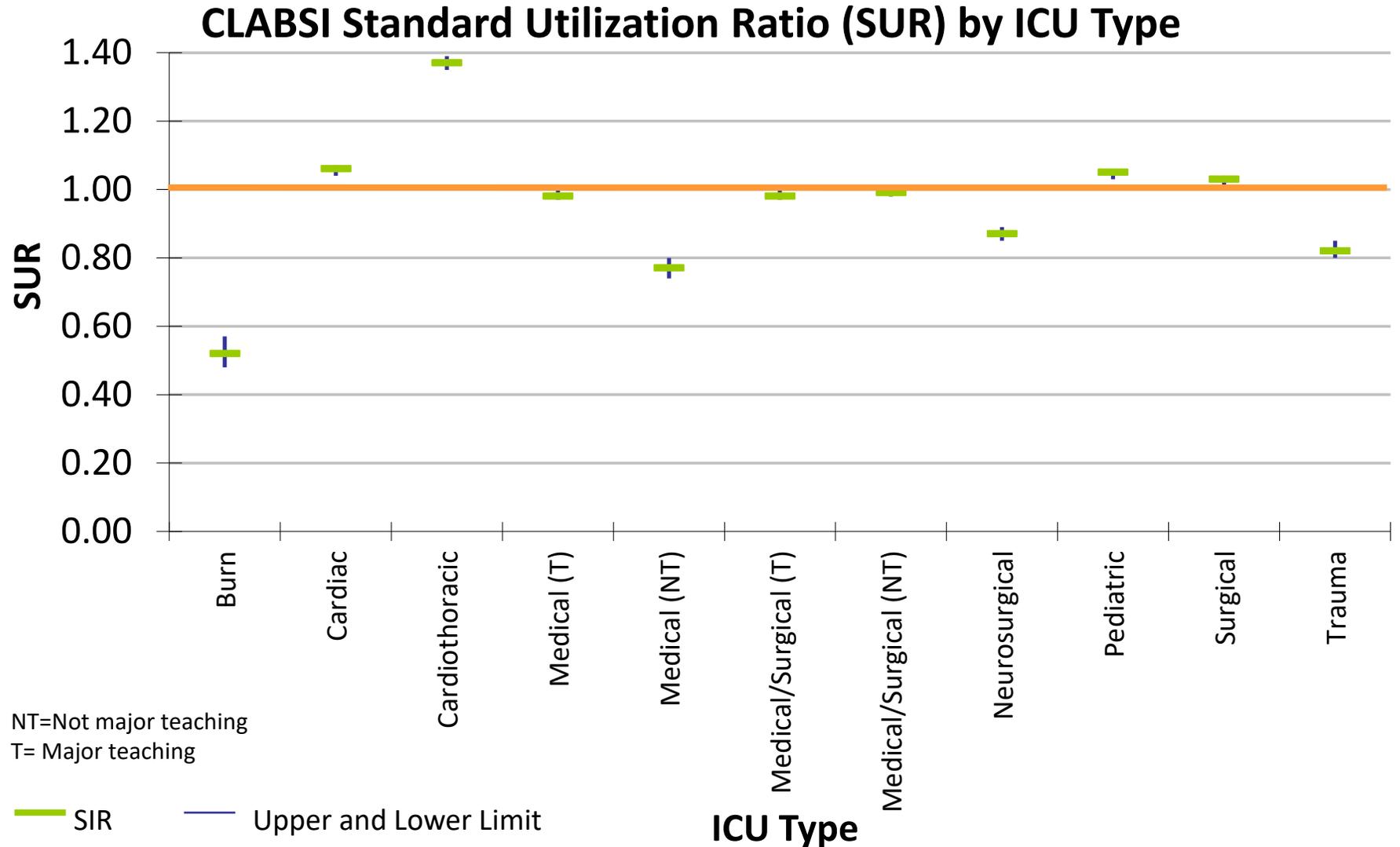


NEW this Year: Central Line-Associated Bloodstream Infection (CLABSI) Standard Utilization Ratio in Adult and Pediatric ICUs

Key Findings

Six ICU types experienced a significantly lower number of device days than predicted, based on 2015 national aggregate data:

- Burn
- Medical (T)
- Medical (NT)
- Medical/Surgical (T)
- Neurosurgical
- Trauma

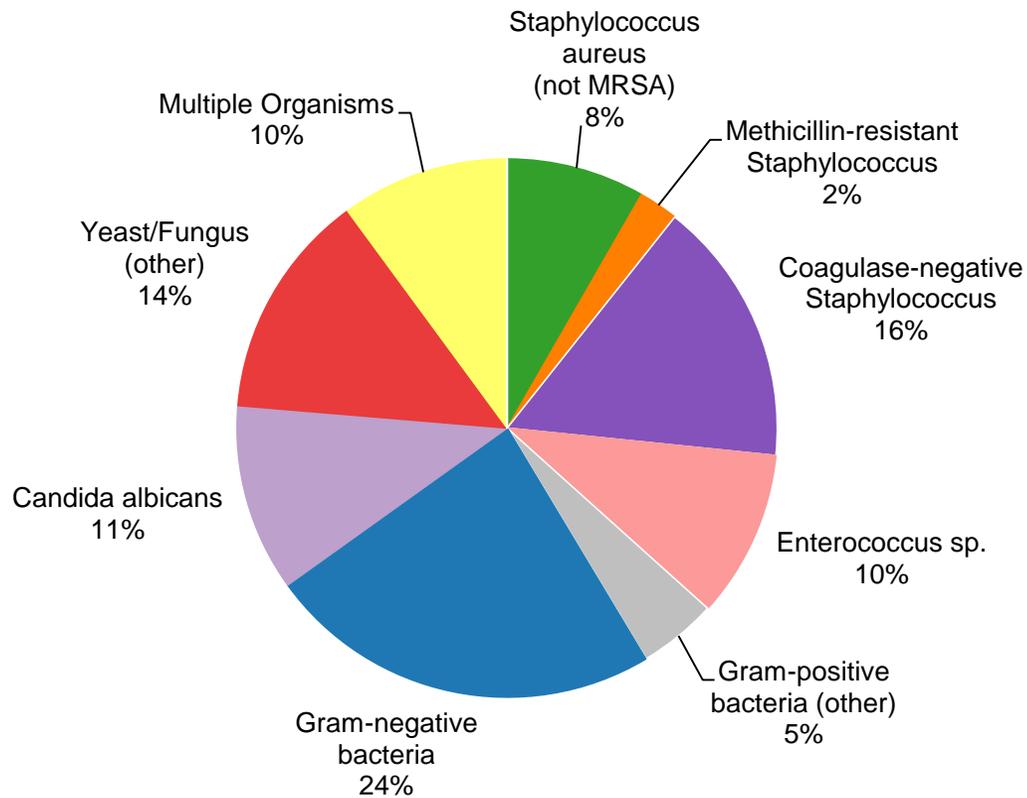


CLABSI Adult & Pediatric ICU Pathogens for 2017 and 2018

Calendar Year 2017

January 1, 2017 – December 31, 2017

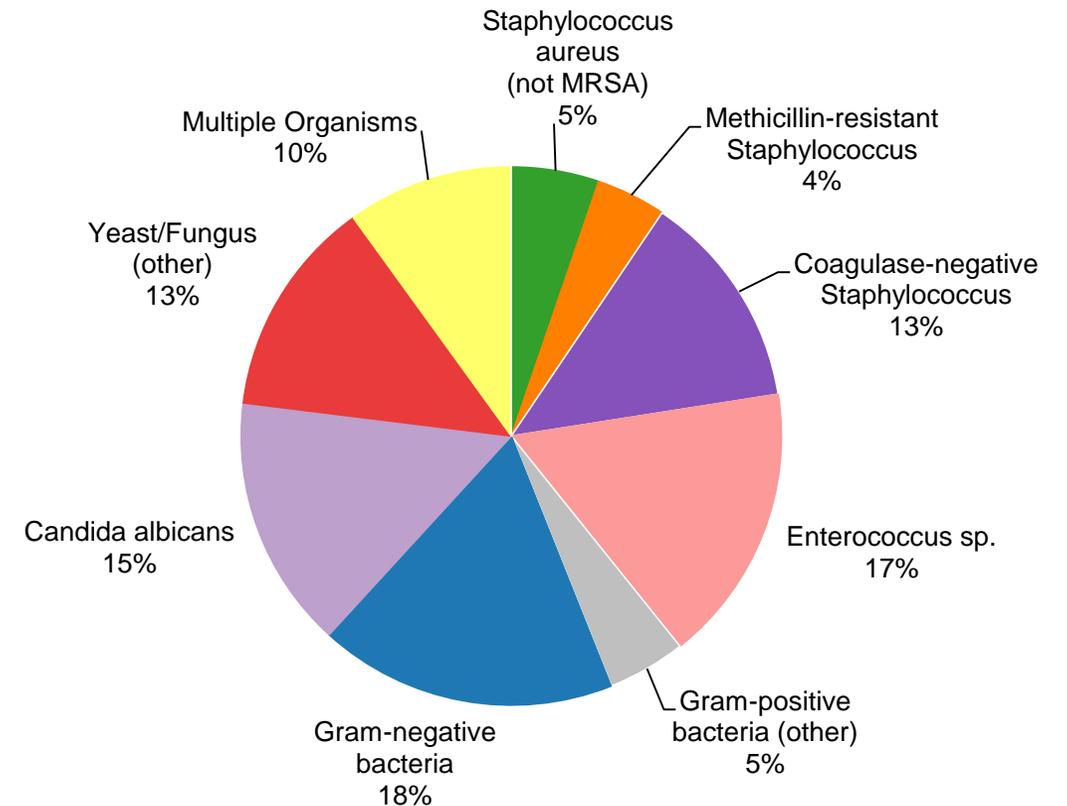
N=169



Calendar Year 2018

January 1, 2018 – December 31, 2018

N=191



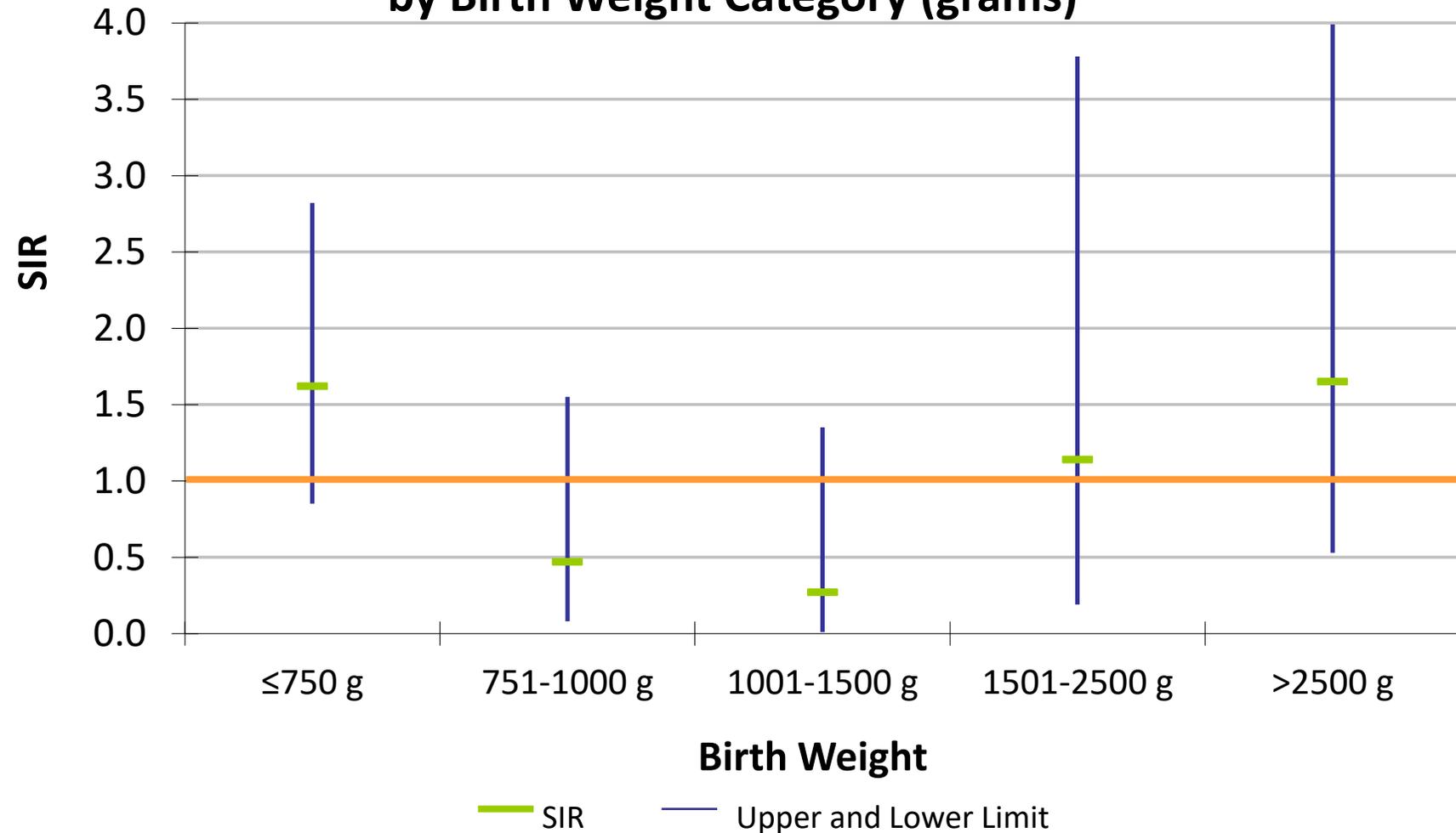
Central Line-Associated Bloodstream Infections (CLABSI) in Neonatal ICUs

Key Findings

There were no birthweight categories experiencing a significantly higher or lower number of infections than predicted, based on 2015 national aggregate data.

There were 20 CLABSIs reported in Neonatal ICUs.

NICU CLABSI Standard Infection Ratio (SIR) by Birth Weight Category (grams)



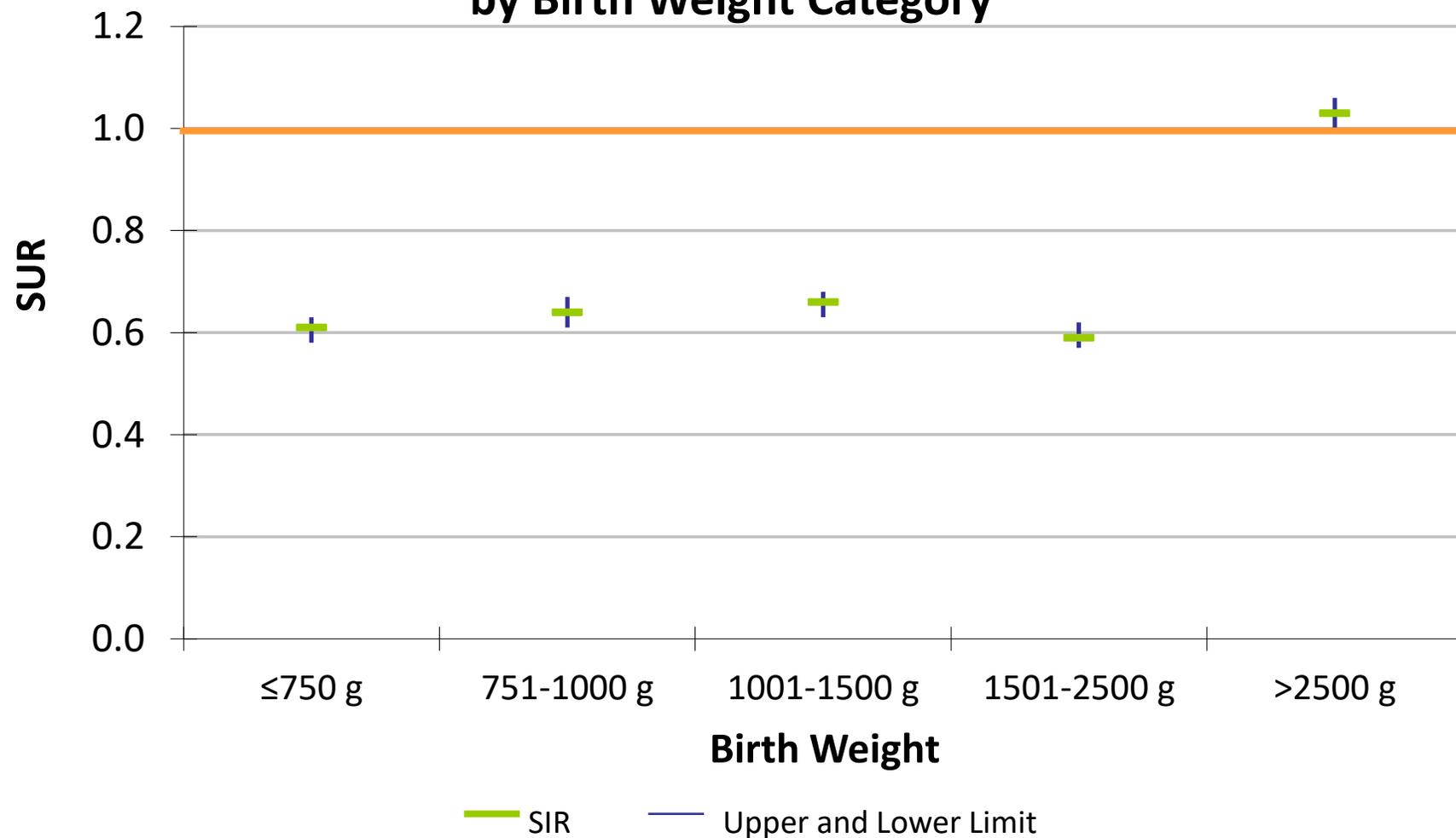
New this Year: Central Line-Associated Bloodstream Infection (CLABSI) Standard Utilization Ratio in Neonatal ICUs

Key Findings

Four birthweight categories experienced a significantly lower number of device days than predicted, based on 2015 national aggregate data:

- Less than or equal to 750 grams
- 751 – 1,000 grams
- 1,001 – 1,500 grams
- 1,501 – 2,500 grams

NICU CLABSI Standard Utilization Ratio (SUR) by Birth Weight Category

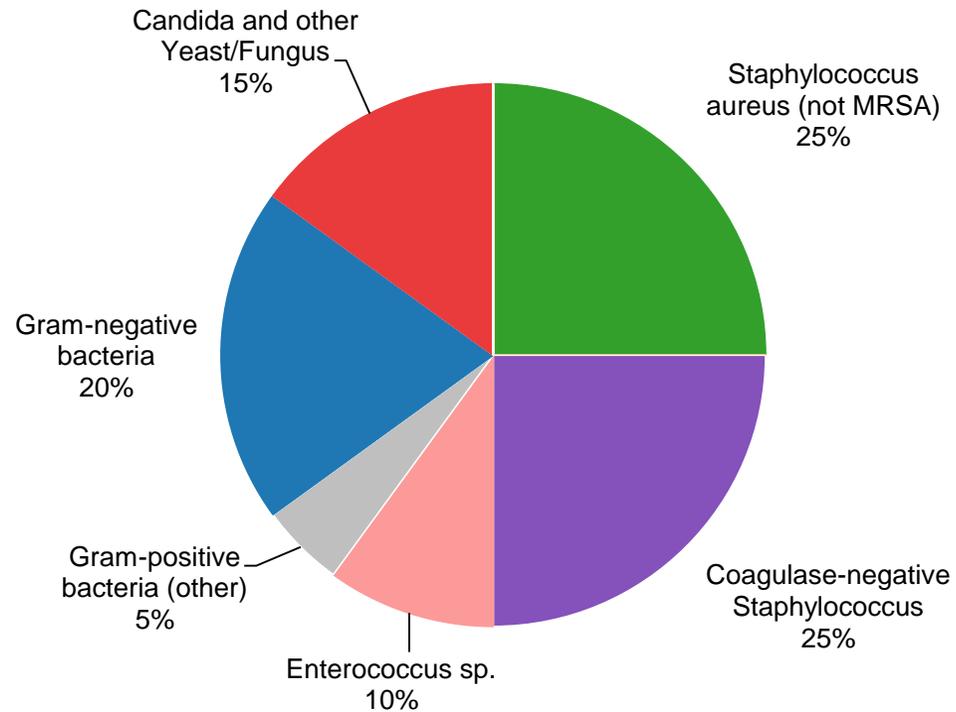


CLABSI NICU Pathogens for 2017 and 2018

Calendar Year 2017

January 1, 2017 – December 31, 2017

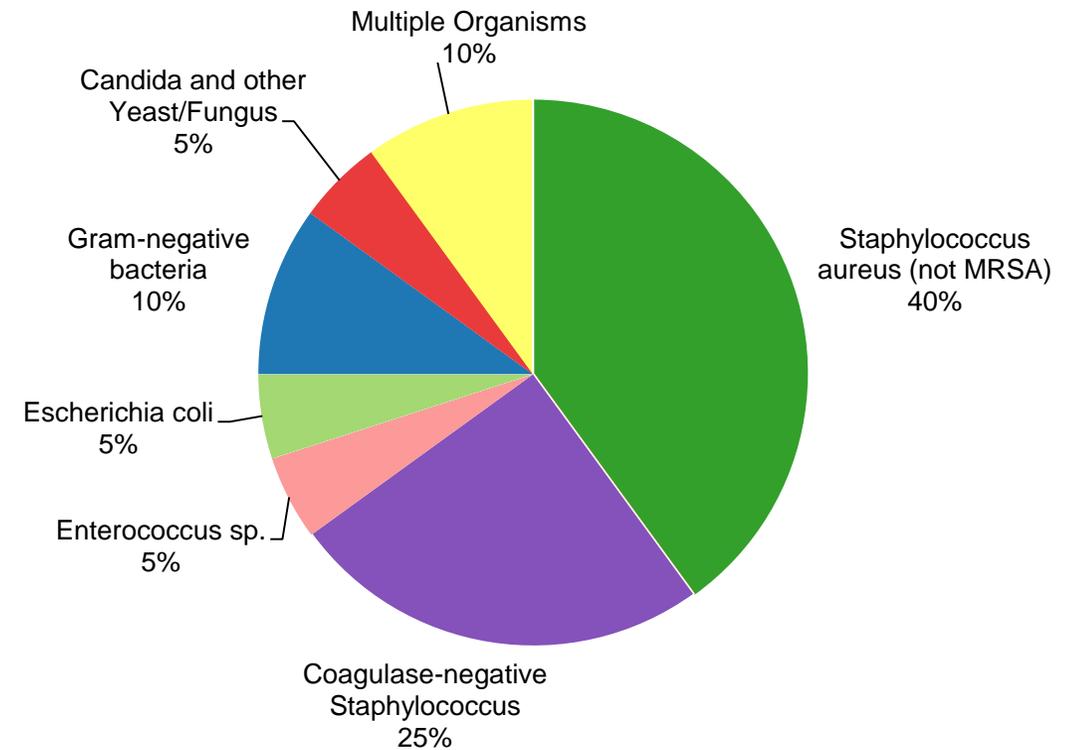
N=20



Calendar Year 2018

January 1, 2018 – December 31, 2018

N=20

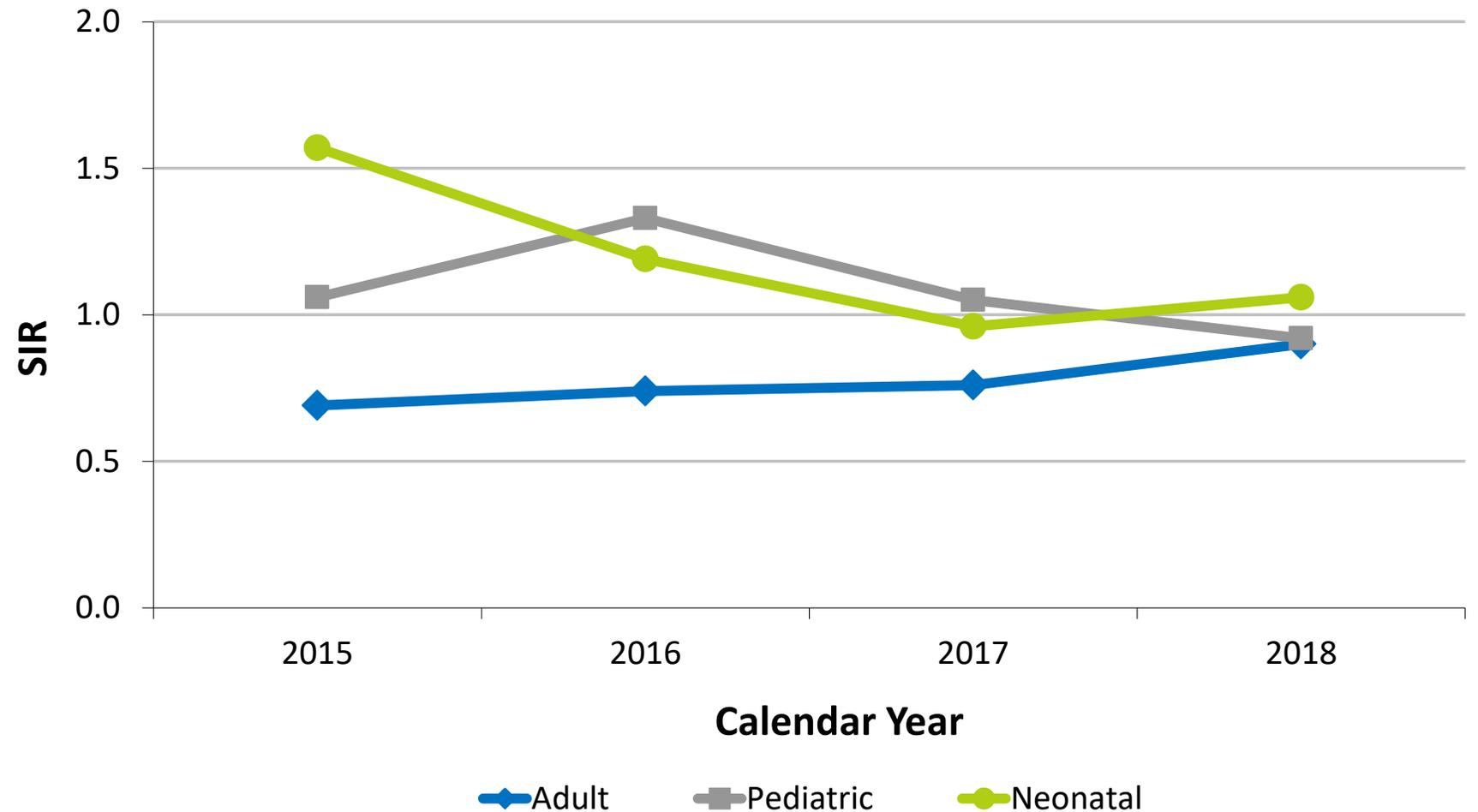


State CLABSI SIR

Key Findings

Between 2015-2017, adult ICUs experienced a significantly lower number of infections than predicted, based on 2015 national aggregate data.

Between 2015-2017, neonatal ICUs saw a decrease in the number of infections.

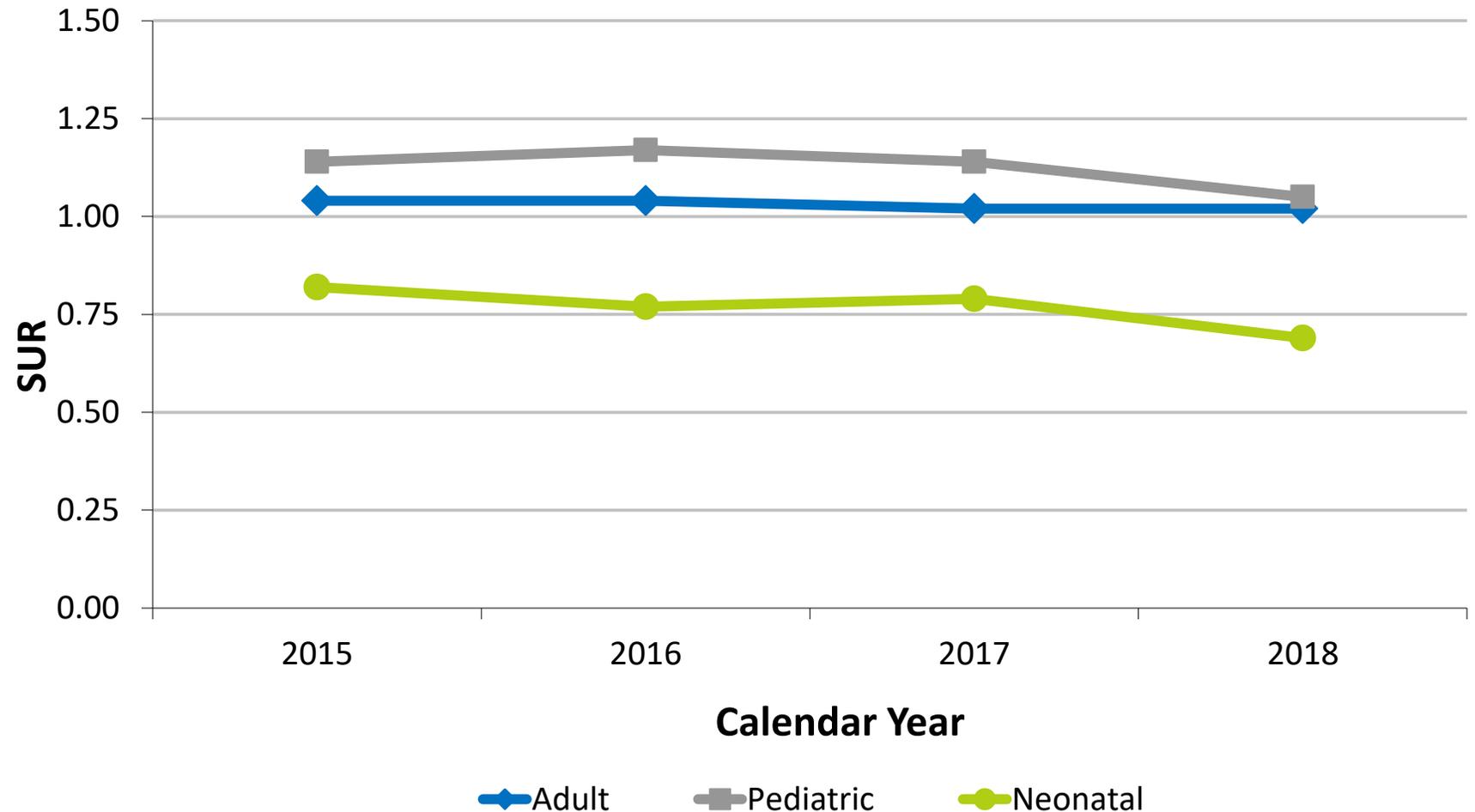


New this Year: State CLABSI SUR

Key Findings

For the past four years:

- Adult and pediatric ICUs experienced a significantly higher number of device days than predicted, based on 2015 national aggregate data
- Neonatal ICUs experienced a significantly lower number of device days than predicted, based on 2015 national aggregate data

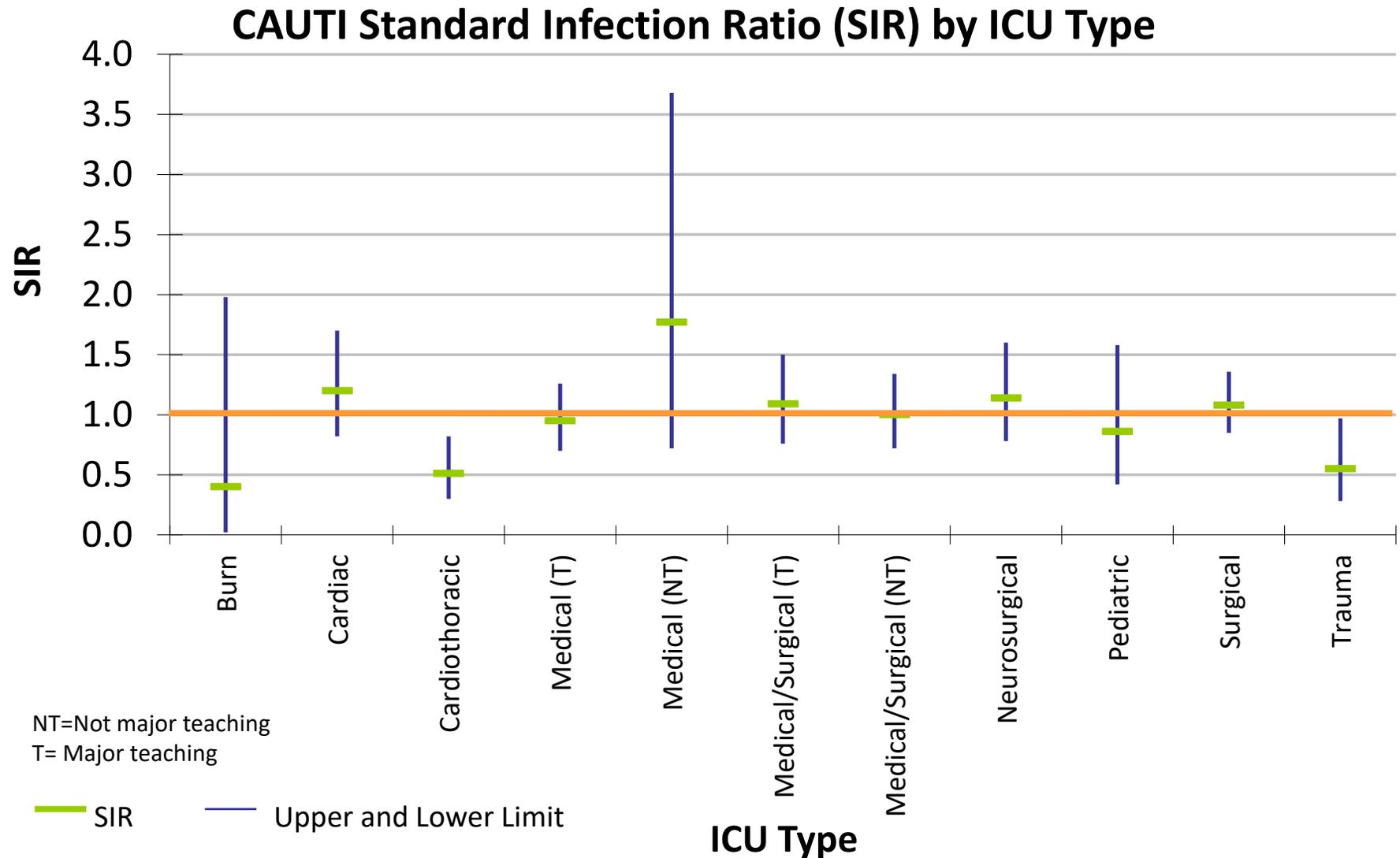


Catheter-Associated Urinary Tract Infections (CAUTI) in Adult and Pediatric ICUs

Key Findings

Two ICU types experienced a significantly lower number of infections than predicted, based on 2015 national aggregate data:
Cardiothoracic
Trauma

No ICUs experienced a significantly higher number of infections than predicted, based on 2015 national aggregate data.

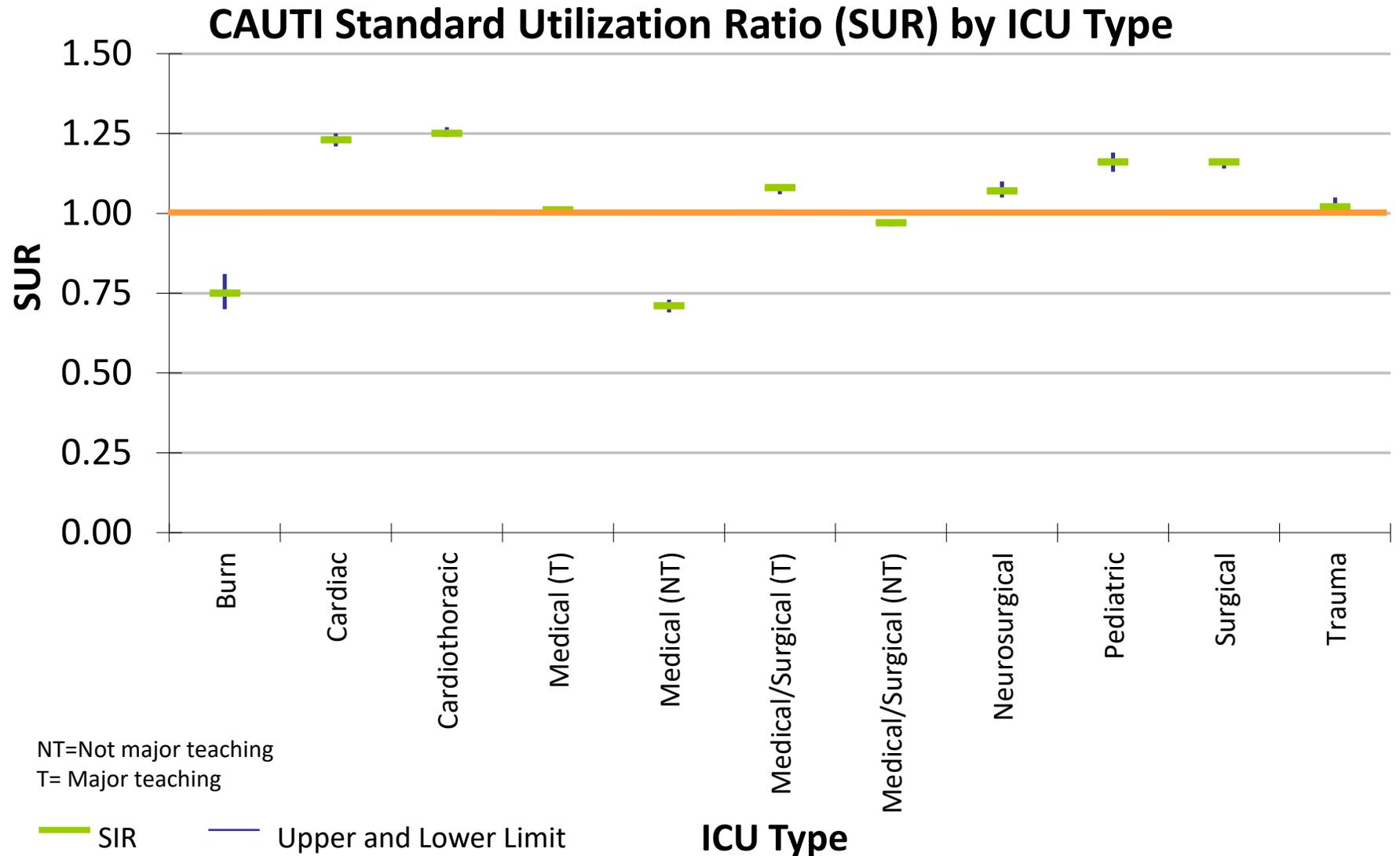


New this Year: Catheter-Associated Urinary Tract Infections (CAUTI) in Adult and Pediatric ICUs

Key Findings

Six ICU types experienced a significantly higher number of device days than predicted, based on 2015 national aggregate data:

- Cardiac
- Cardiothoracic
- Medical/Surgical (T)
- Neurosurgical
- Pediatric
- Surgical

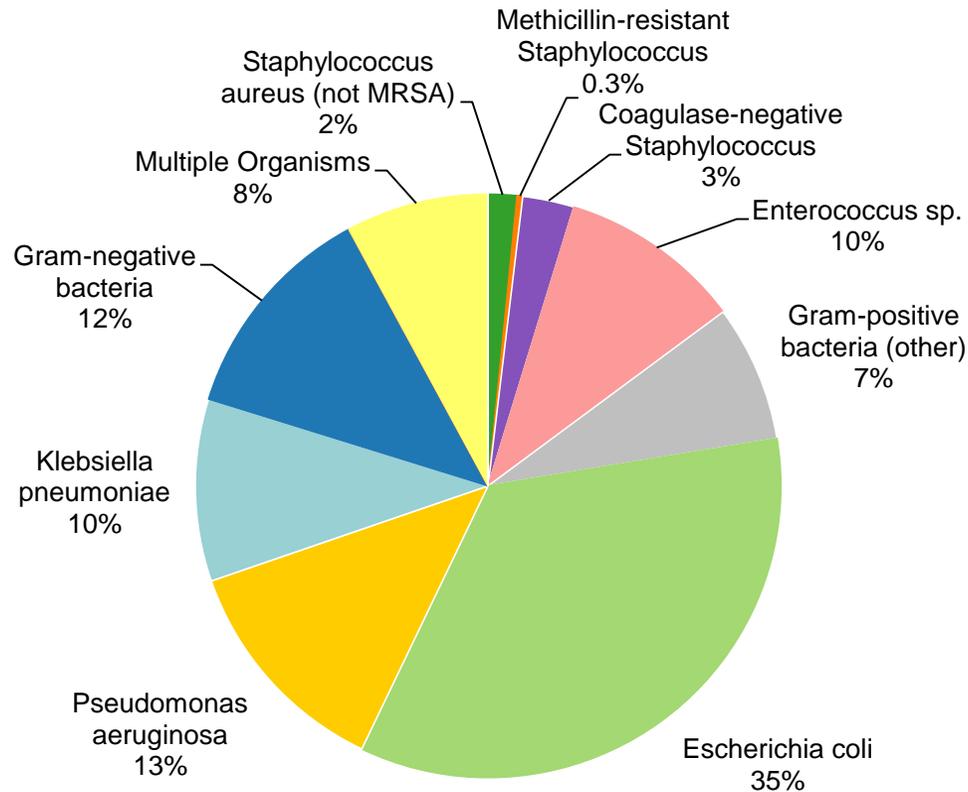


CAUTI Adult & Pediatric ICU Pathogens for 2017 and 2018

Calendar Year 2017

January 1, 2017 – December 31, 2017

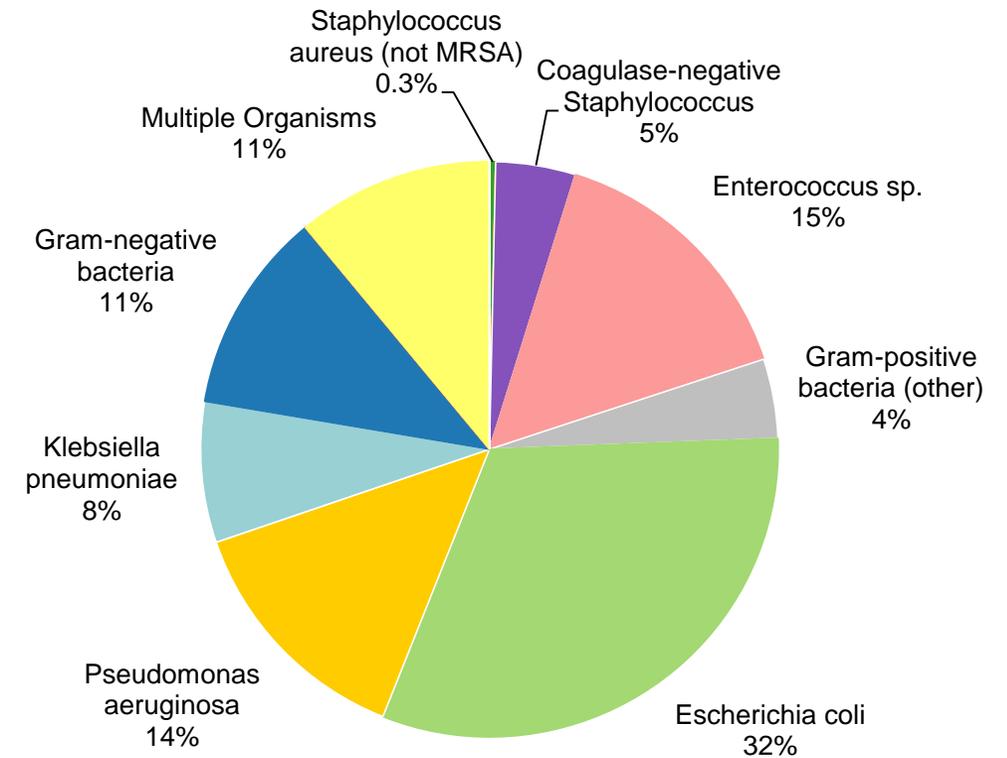
N=317



Calendar Year 2018

January 1, 2018 – December 31, 2018

N=293

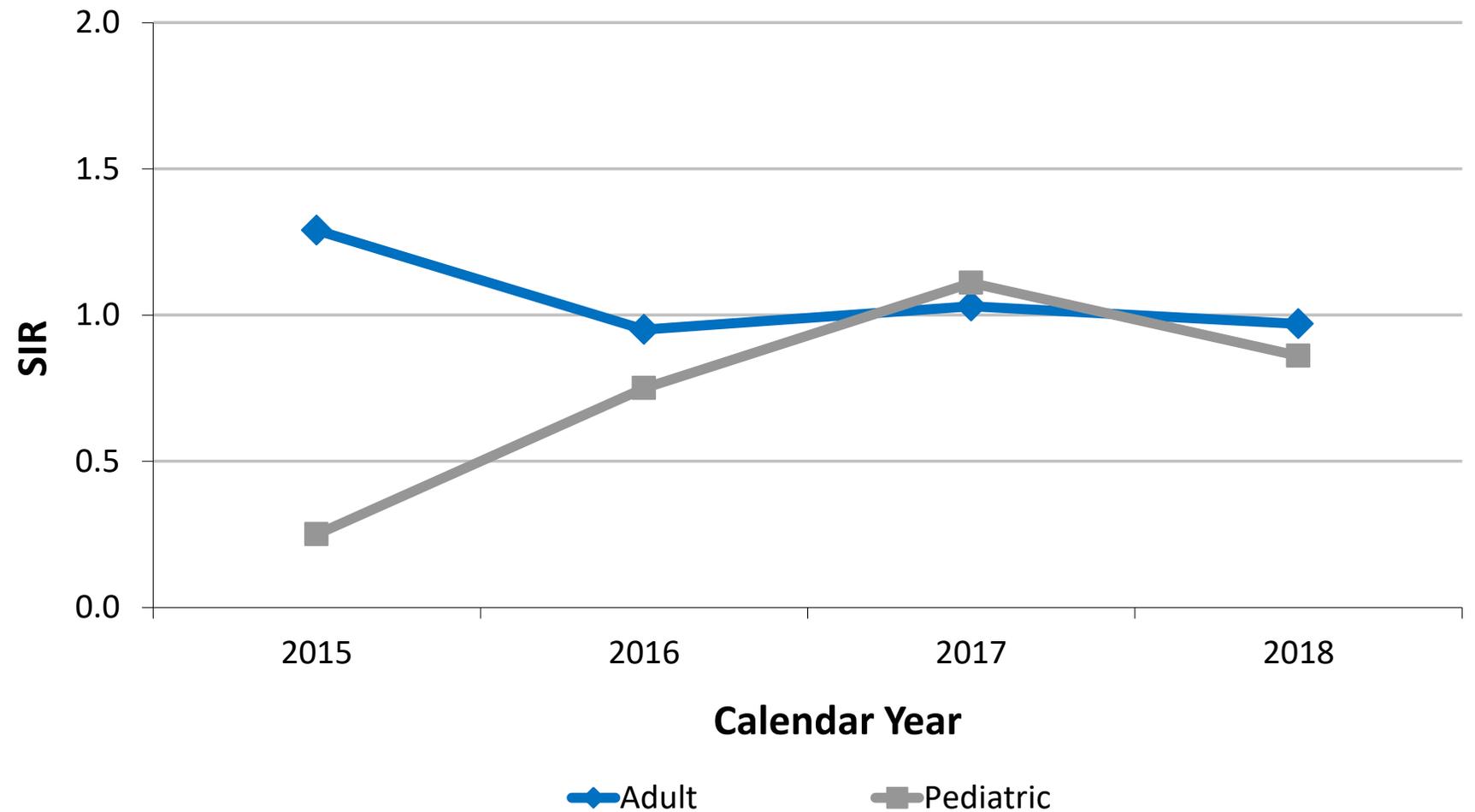


State CAUTI SIR

Key Findings

Between 2015-2017, pediatric ICUs saw an increase in the number of infections but in 2018 were no different than predicted, based on 2015 national aggregate data.

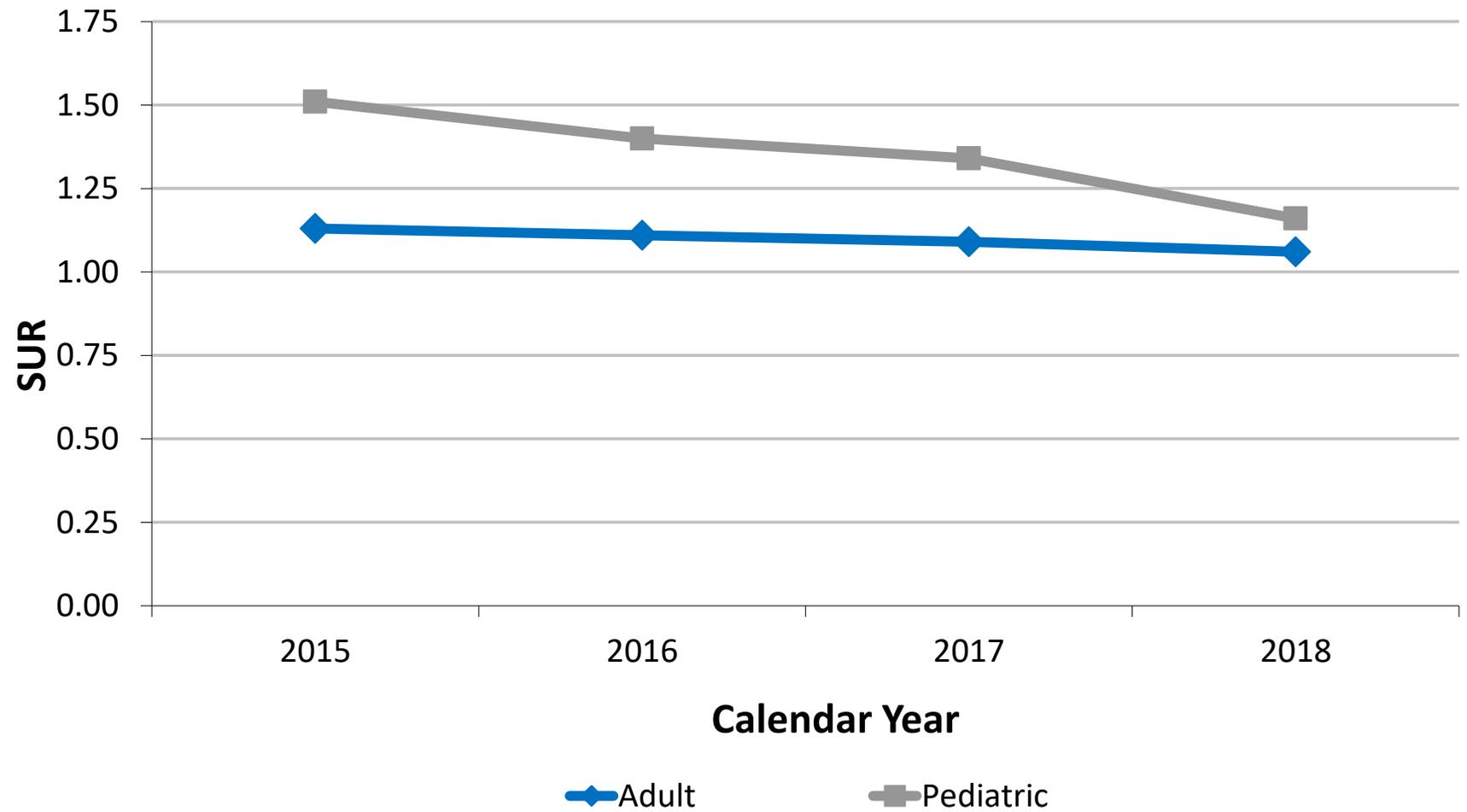
There were 9 CAUTIs reported by 10 pediatric ICUs in 2018.



New this Year: State CAUTI SUR

Key Findings

For the past four years, adult and pediatric ICUs experienced a significantly higher number of device days than predicted, based on 2015 national aggregate data.



Surgical Site Infections (SSI)

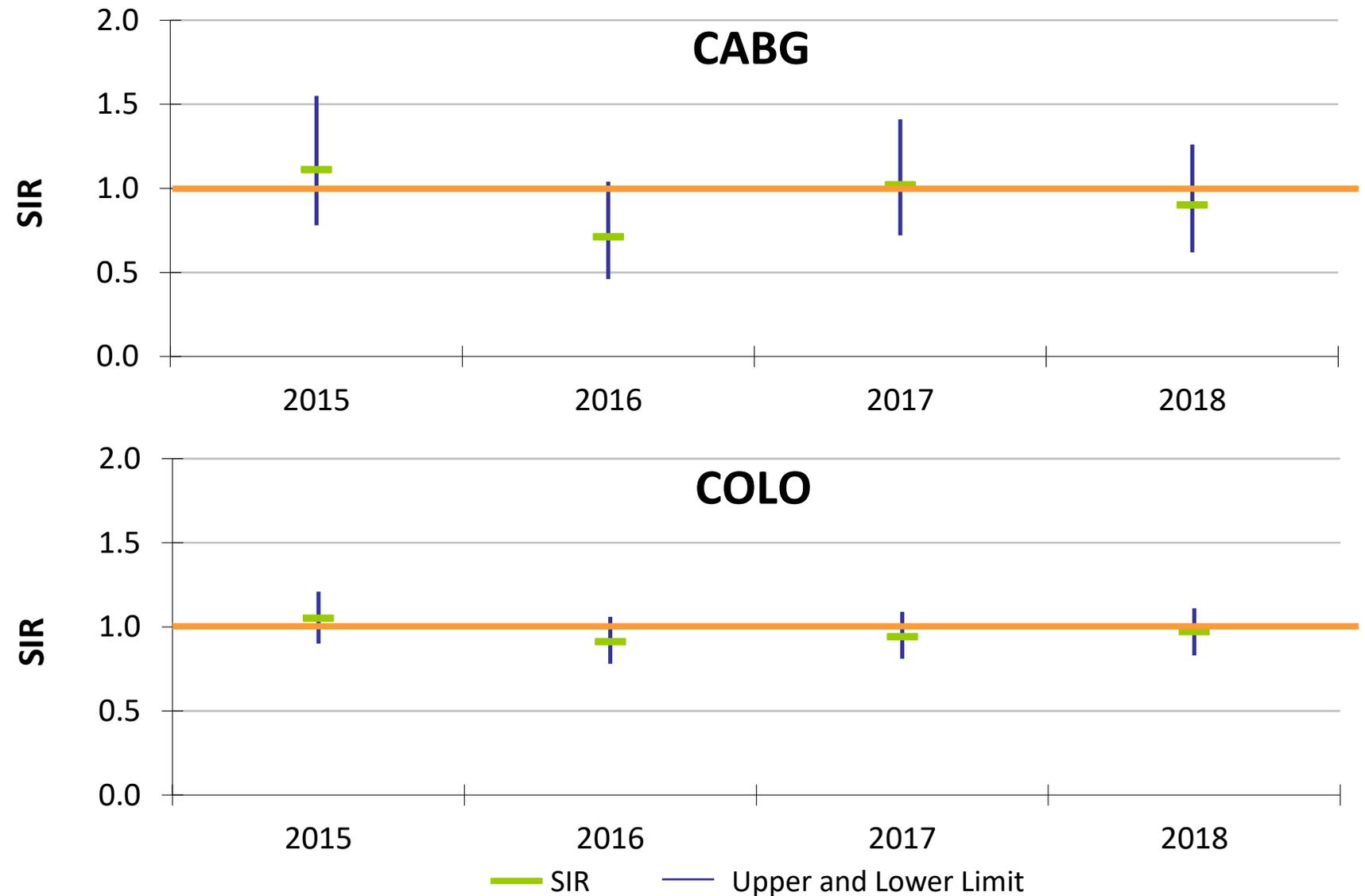
Coronary Artery Bypass Graft (CABG) SIR and Colon Procedure (COLO) SIR

Key Findings

For the past four years, MA acute care hospitals performing coronary artery bypass graft procedures (CABG) and colon procedures (COLO) experienced the same number of infections as predicted, based on 2015 national aggregate data.

There were 31 CABG SSIs reported in 2018.

There were 184 COLO SSIs reported in 2018.



Surgical Site Infections (SSI)

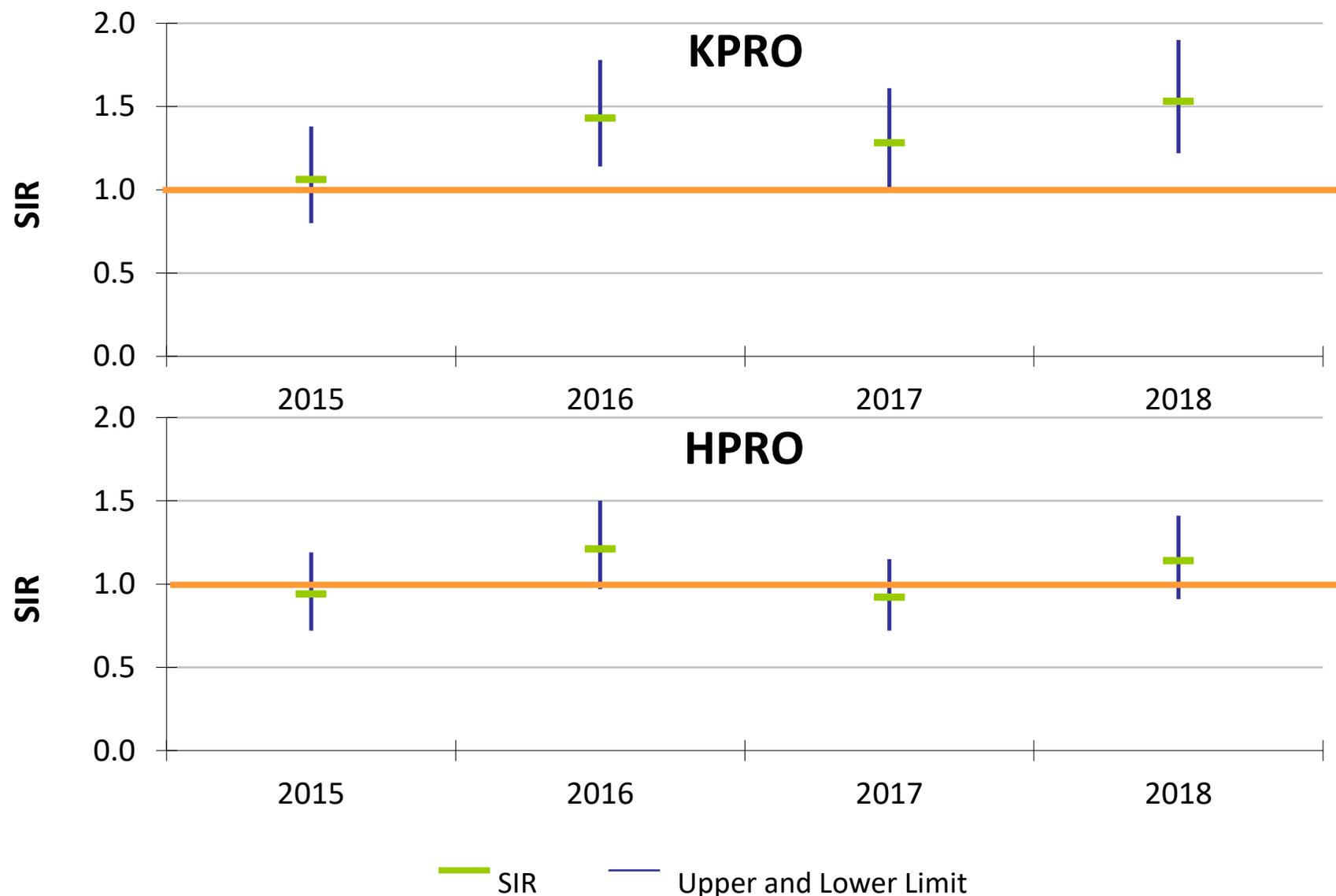
Knee Prosthesis (KPRO) SIR and Hip Prosthesis (HPRO) SIR

Key Findings

In 2018, Massachusetts acute care hospitals performing knee prosthesis procedures (KPRO) experienced significantly higher number of infections than predicted, based on 2015 national aggregate data.

There were 77 KPRO SSIs reported in 2018.

There were 81 HPRO SSIs reported in 2018.



Surgical Site Infections (SSI)

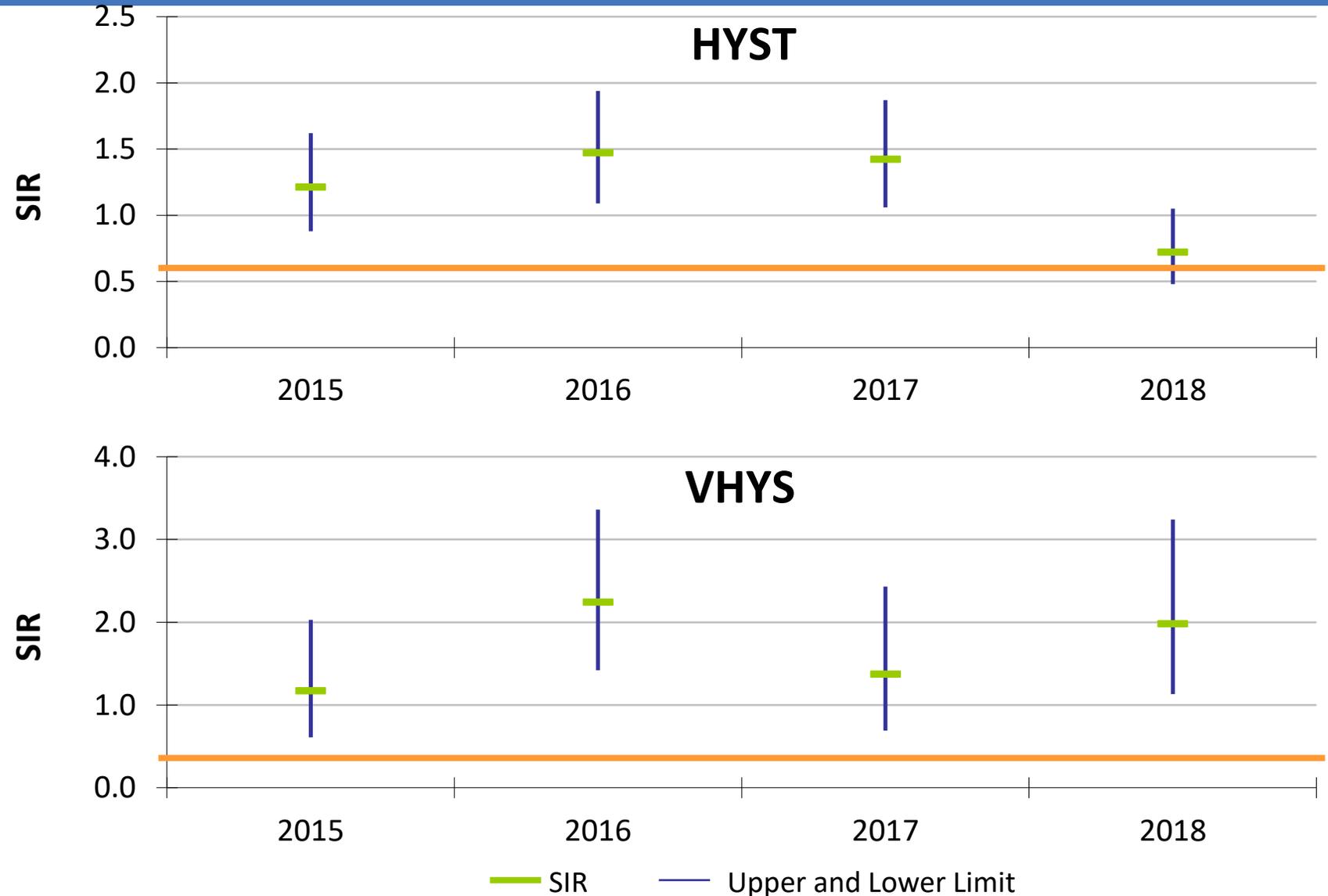
Abdominal Hysterectomy (HYST) SIR and Vaginal Hysterectomy (VHYS) SIR

Key Findings

In 2018, Massachusetts acute care hospitals performing vaginal hysterectomy (VHYS) procedures experienced significantly higher number of infections than predicted, based on 2015 national aggregate data.

There were 25 HYST SSIs reported in 2018.

There were 14 VHYS SSIs reported in 2018.



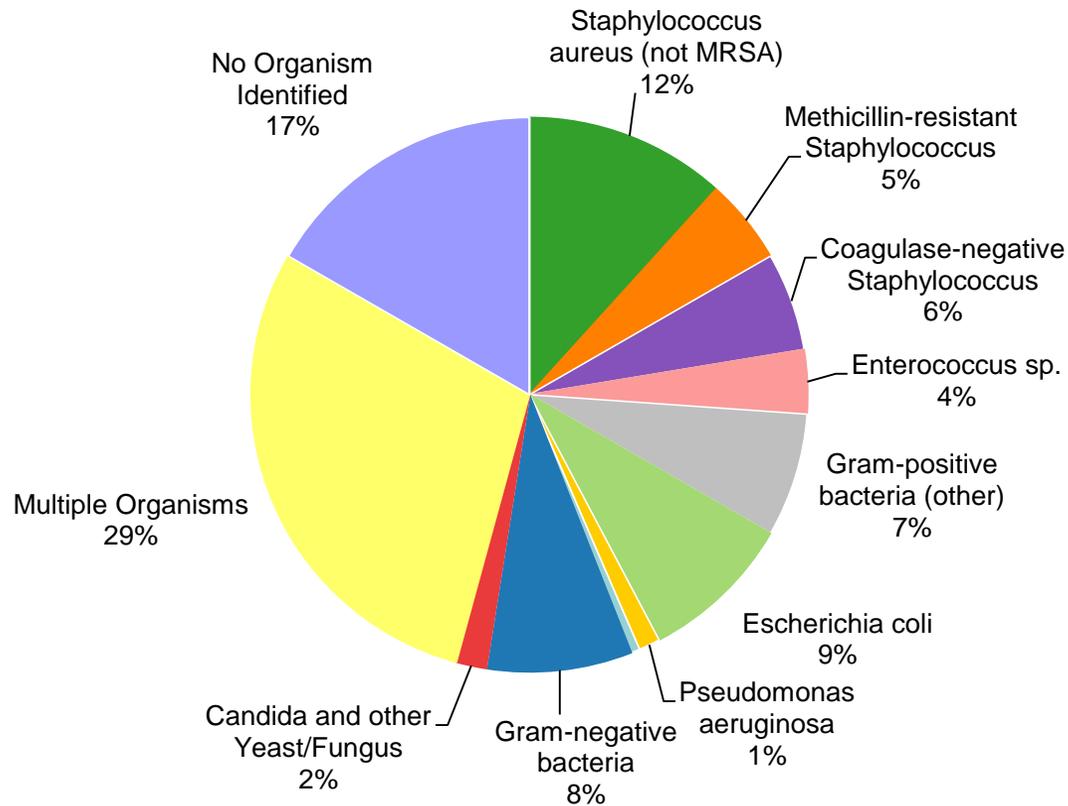
SSI Pathogens for 2017-2018

CABG, KPRO, HPRO, HYST, VHYS, COLO

Calendar Year 2017

January 1, 2017 – December 31, 2017

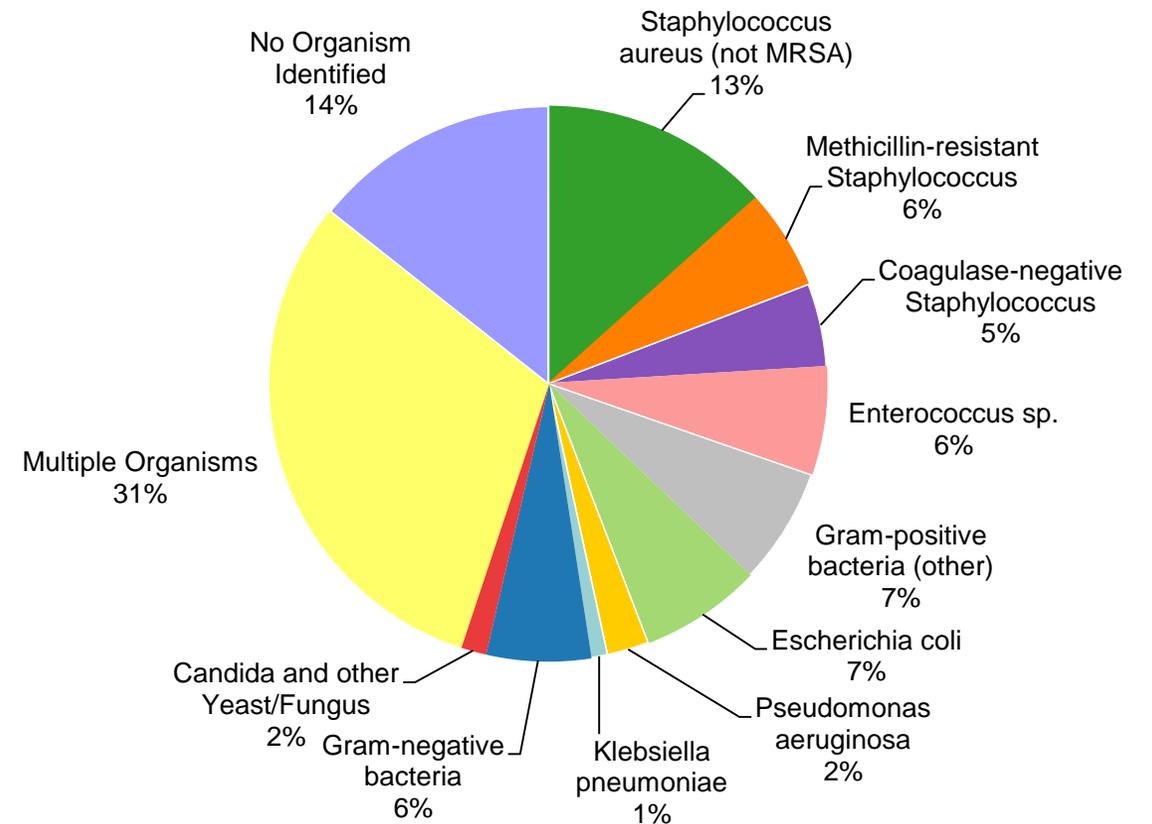
N=402



Calendar Year 2018

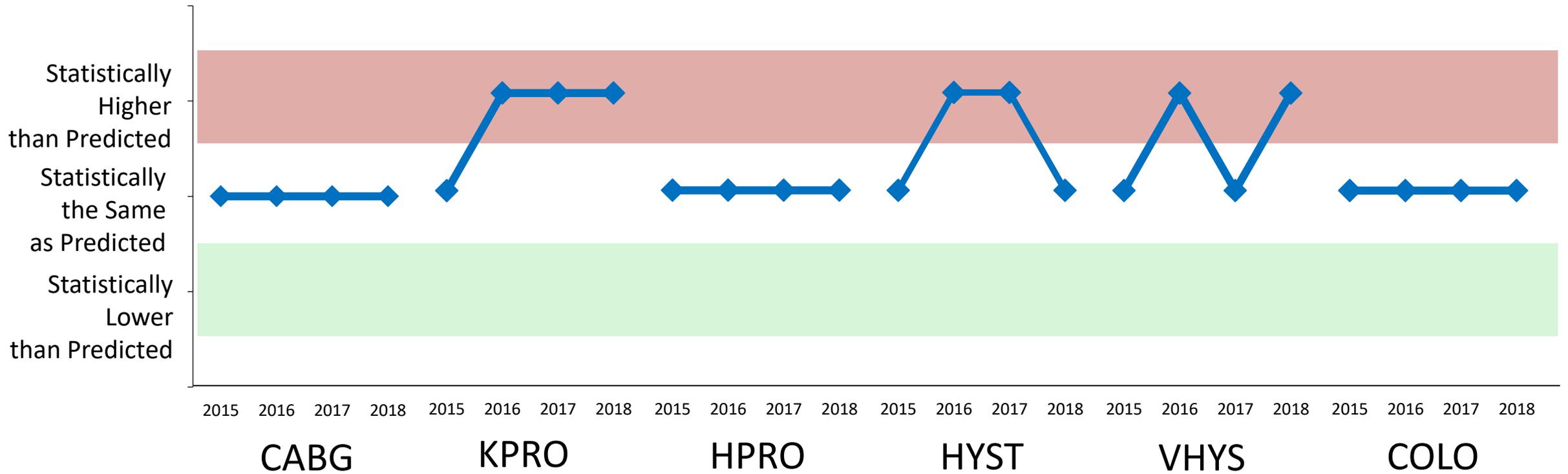
January 1, 2018 – December 31, 2018

N=412



Statewide SSI Trends by Year

2015-2018



Laboratory Identified Events (LabID)

Clostridioides difficile (CDI) SIR

Key Findings

For the past two years, Massachusetts hospitals reporting CDI events experienced significantly lower number of infections than predicted, based on 2015 national aggregate data.

There were 1,904 CDI events reported in 2018.



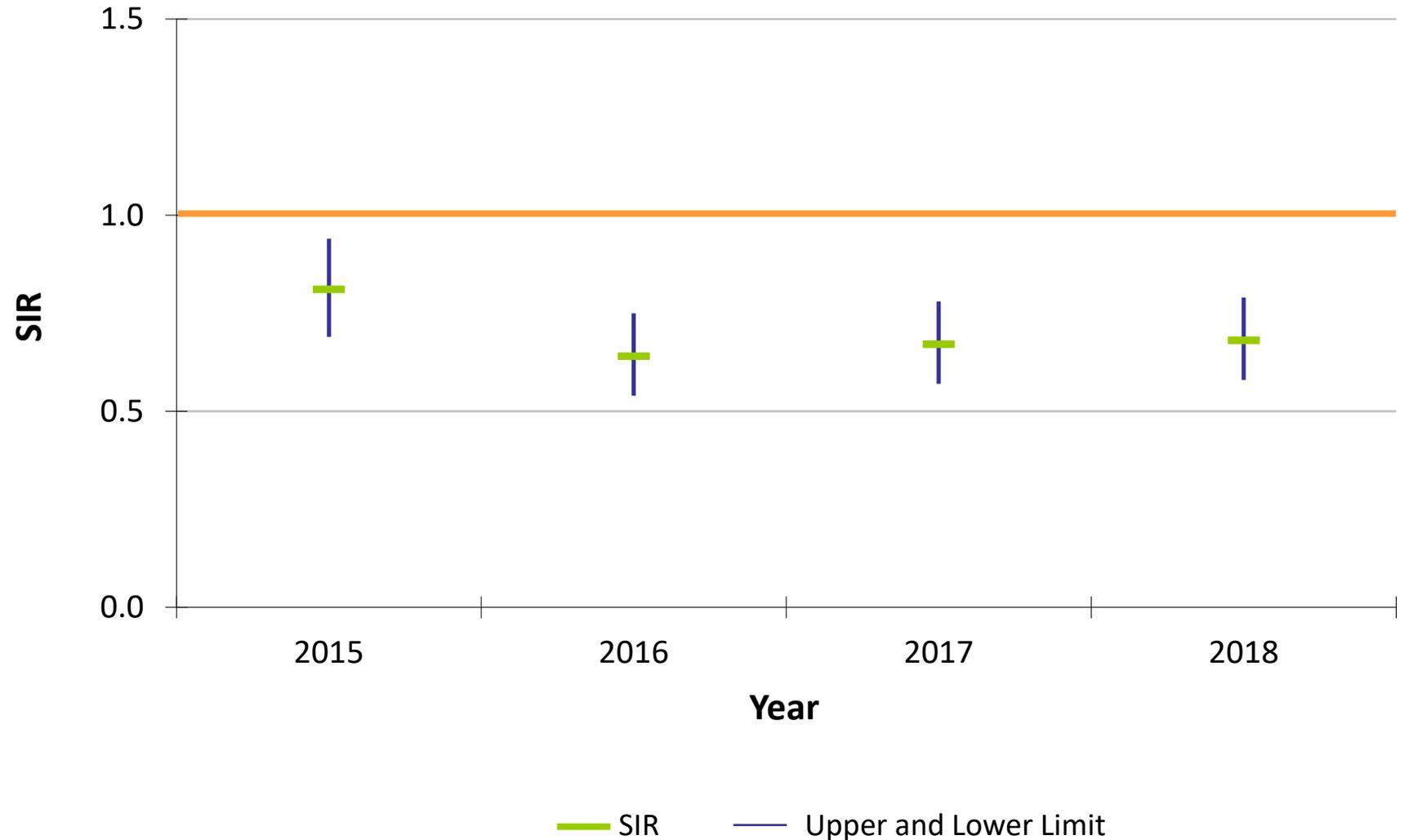
Laboratory Identified Events (LabID)

Methicillin-resistant Staphylococcus aureus (MRSA) SIR

Key Findings

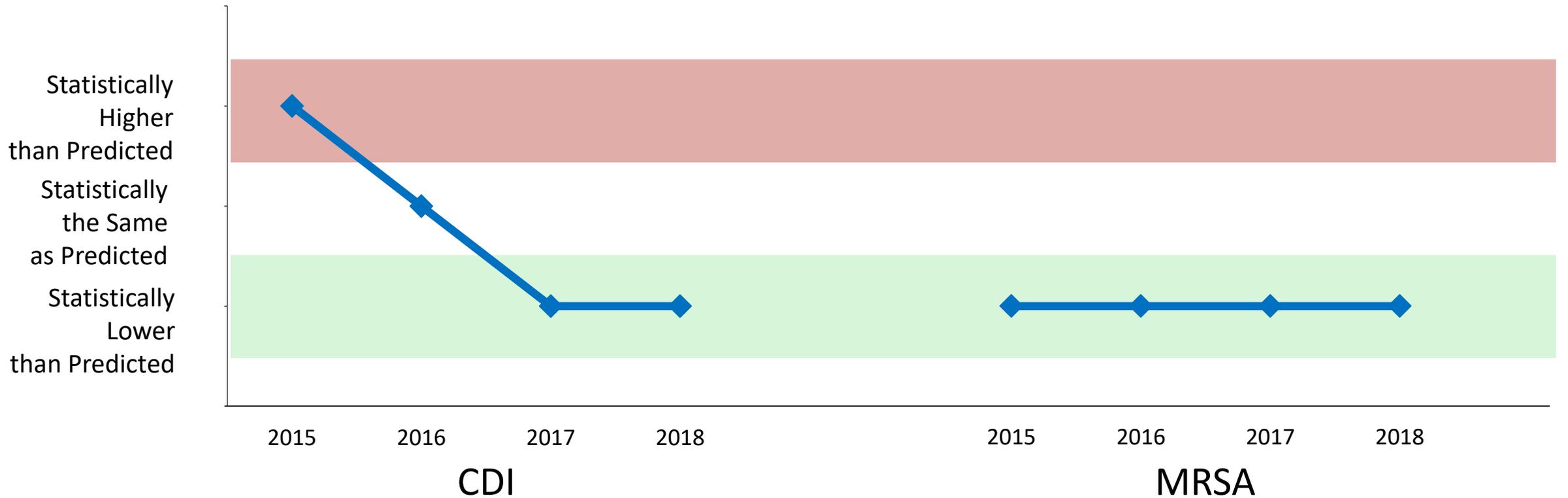
For the past four years, Massachusetts acute care hospitals reporting MRSA events experienced significantly lower number of infections than predicted, based on 2015 national aggregate data.

There were 160 MRSA events reported in 2018.



Statewide LabID Trends by Year

2015-2018



DPH HAI Prevention Activities

- External data validation of methicillin resistant *Staphylococcus aureus* infections conducted at 20 acute care hospitals and *Clostridioides difficile* infection at 20 long-term care facilities in the fall of 2018 and spring of 2019.
- DPH outreach to long-term care facilities to sustain voluntary NHSN *Clostridioides difficile* reporting; monthly data cleaning reports generated by DPH and provided to facilities beginning in 2019.
- Ongoing data sharing with the Neonatal Quality Improvement Collaborative (NeoQIC) to address opportunities for improvement.
- Four hemodialysis infection prevention simulation trainings were held for hemodialysis nurses and technicians.
- On-site Infection Control Assessment and Response (ICAR) visits expanding from nursing homes and long-term acute care facilities to community health centers.
- DPH monitors progress by providing quarterly Data Cleaning Reports and Targeted Assessment for Prevention (TAP) Reports for all hospitals to identify areas where focused infection prevention efforts are needed.
- Outreach to hospitals with higher than expected SIRs to ensure the need for improvement has been addressed.

Antibiotic Resistance: Scope and Significance of the Issue

- Antibiotic or antimicrobial resistance occurs when organisms are able to resist the effects of drugs. Bacteria are not killed by the antibiotic and continue to grow.
- Some individuals may be at a greater risk for acquiring a drug resistant infection (individuals with co-morbidities, previous hospitalizations, antibiotic exposures, etc.). However, drug-resistant infections can affect anyone.
- Infections with resistant organisms can be difficult to treat, are expensive and are associated with increased mortality.
- Inevitably, bacteria are able to adapt to newly developed antibiotics and become resistant.
- It is imperative to respond aggressively to prevent resistance and prevent the spread of existing resistant bacteria.
- DPH surveils several multi-drug resistant organisms (MDROs) that have been identified as public safety concerns by CDC.

Antibiotic Resistance Surveillance: Carbapenem-resistant *Enterobacteriaceae* in MA

Organism	2016	2017	2018
<i>Enterobacter cloacae</i>	22	88	126
<i>Klebsiella oxytoca and pneumoniae</i>	15	78	89
<i>Escherichia coli</i>	5	32	88
<i>Enterobacter aerogenes</i>	8	17	16
Total	50	215	319

Antibiotic Resistance: MDROs in Massachusetts

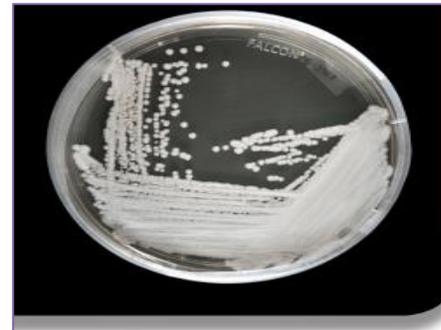
Candida auris Example

DPH provides epidemiologic investigation support and guidance when specific MDROs are suspected to mitigate any exposure.

Activities include:

- Provide detailed infection control recommendations
- Recommend retrospective and prospective laboratory surveillance
- Coordinates colonization screening of close contacts in collaboration with regional laboratory

	2017	2018
Confirmed	6	0
Contact	75	10
Suspect	0	1



Candida auris:
A drug-resistant germ that spreads in healthcare facilities

Candida auris (also called *C. auris*) is a fungus that causes serious infections. Patients with *C. auris* infection, their family members and other close contacts, public health officials, laboratory staff, and healthcare workers can all help stop it from spreading.

Antibiotic Stewardship Overview

- Studies indicate that between 30-50% of antibiotics prescribed in hospitals and between 40-75% of antibiotics prescribed in nursing homes are unnecessary*
- Improved prescribing practices can help reduce rates of *Clostridioides difficile* and antibiotic resistance
- Appropriate antibiotic prescribing can improve patient outcomes and reduce healthcare costs

*<https://www.cdc.gov/antibiotic-use/healthcare/>
<https://www.cdc.gov/longtermcare/prevention/antibiotic-stewardship.html>

Antibiotic Resistance and Antibiotic Stewardship: DPH Reporting and Laboratory Testing

- Electronic laboratory reporting (ELR) of mandatory MDROs of concern into the Massachusetts Virtual Epidemiologic Network (MAVEN)
- Mandatory submission of selected MDRO isolates to the Massachusetts State Public Health Laboratory for advanced testing here and at our partner ARLN laboratory, The Wadsworth Center in New York:
 - Identify novel resistance mechanisms such as genes that code for carbapenemase production or colistin resistance
 - Identify *Candida auris*

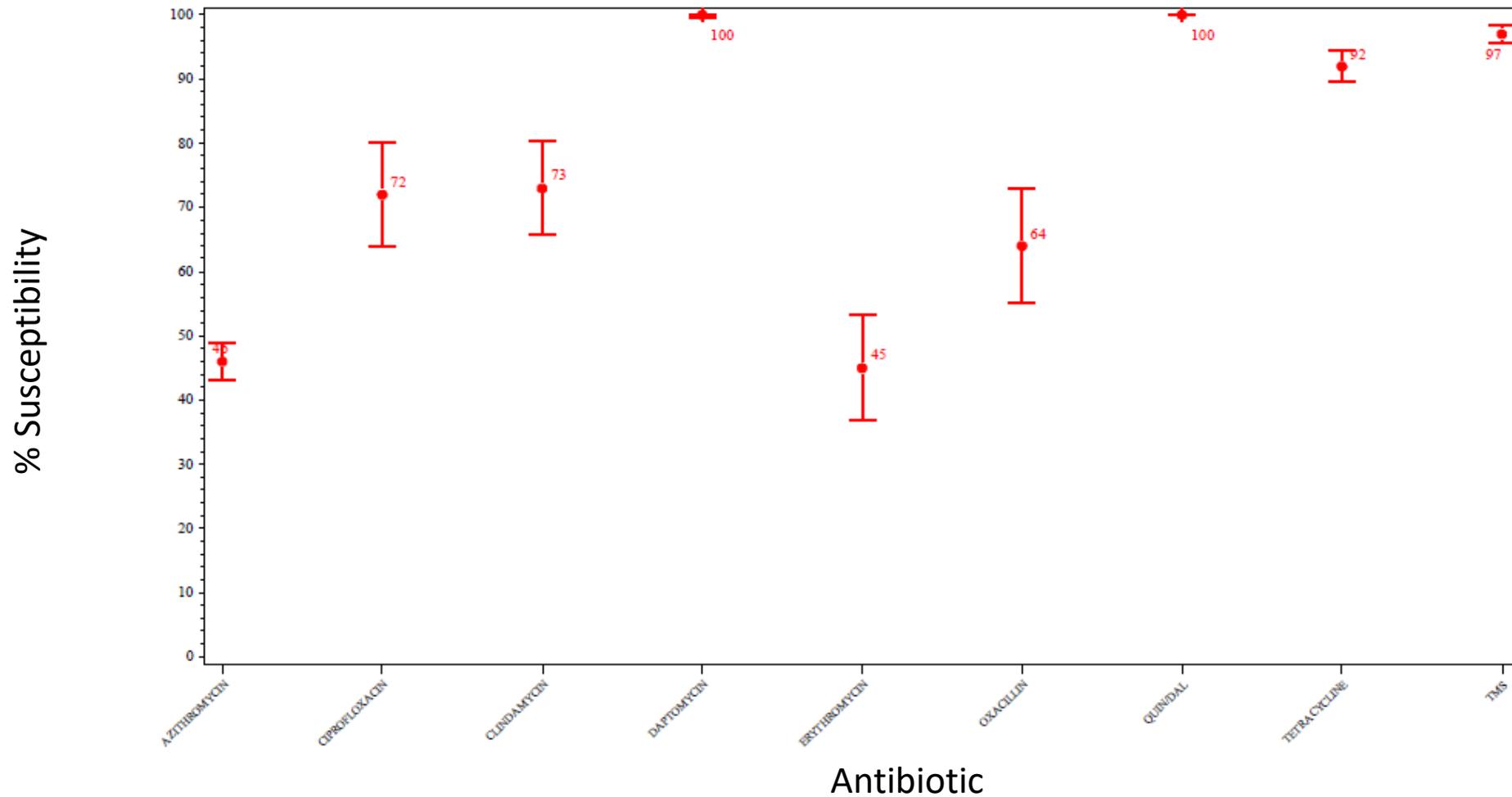
Antibiotic Resistance and Antibiotic Stewardship: Prevention and Educational Activities

- **NEW:** 14 acute care hospitals participate in NHSN antibiotic use (AU) module to better understand trends in antibiotic use and monitor stewardship activities
- 2018-2019 Advanced Educational Series entitled “*Navigating Infection Control and Antibiotic Stewardship in Long-Term Care*” with three “ask the experts” calls
- Collection, monitoring and reporting of facility-level antibiotic use data in long-term care facilities (n=60)
- “Bug of the Month” webinar series targeting MDROs of concern for all facility types.
- Publication of annual statewide antibiogram
 - Provides bug-drug combinations of interest for benchmarking purposes (<https://www.mass.gov/service-details/massachusetts-antibiograms>)
- Engagement with subject matter experts and stakeholders during quarterly statewide HAI/AR Technical Advisory Group (TAG) meetings
- Held the first annual Statewide Antibiotic Stewardship Conference in April, 2019 for long term, long term acute, ambulatory, dialysis and dental care settings

Antibiotic Resistance and Antibiotic Stewardship: DPH Antibiograms

Staphylococcus aureus Susceptibility Rates – 2017

Statewide



TMS

Antibiotic Resistance and Antibiotic Stewardship: Next Steps

- Awarded a competitive Broad Agency Announcement contract from the CDC to examine antibiotic prescribing in dentistry in MA and to evaluate a feedback intervention for top prescribers
- Incorporate recommendations and findings determined by two national Leadership in Epidemiology, Antimicrobial Stewardship and Public Health (LEAP) fellows, to improve the utility of the statewide antibiogram data and to enhance AS activities in long-term care facilities
- Continue to engage additional infection preventionists in use of MAVEN system for ease in response and containment of MDROs

Contact Information

Thank you for the opportunity to present this information today.

Please direct any questions to:

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